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AZW-27-070

HANDBOOK
WEIGHT AND BALANCE DATA

ASM-65-28L

[redacted]

UNCLASSIFIED

HANDBOOK

Report AZW-27-070
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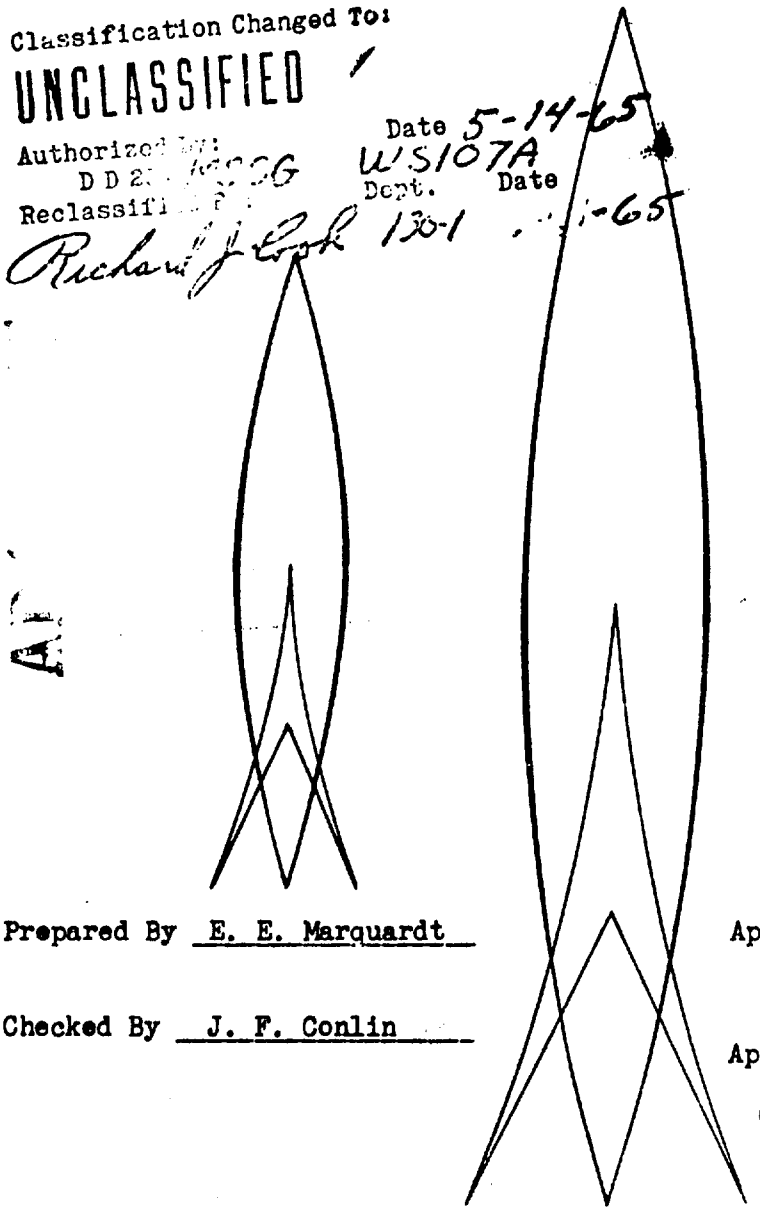

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WEIGHT AND BALANCE DATA

MODEL XSM-65D-28D MISSILE

SERIAL NO. USAF 58-2199

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RECORD OF WEIGHT AND BALANCE PERSONNEL				
MISSILE MODEL XSM-65 - 28D		SERIAL NUMBER USAF 58-2199		
NAME	GRADE	STATION	DATE ASSIGNED	DATE RELIEVED
E. E. Marquardt	Eng.Asst.	Convair Astronautics		19 Oct. 1959

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TABLE OF CONTENTS

UNCLASSIFIED

FOREWARD

This Handbook is presented for use by field personnel as a device for instruction and accounting in maintainance of accurate weight and balance data for missiles after factory delivery.

There is, at this date, no official requirement for this Handbook among the Operational missile documentation records. Further, there is no theoretical requirement to maintain field weight and balance control for the Operational missiles if it be assumed that changes to configuration after factory delivery will not significantly affect the flight weight status, and, if it be assumed also that mission objectives will always be within the contractual performance limitation.

However, practical considerations make it necessary to presume that configuration changes of significant and indeterminate effect on the missile weight status are likely, at least during the balance of the Atlas R&D program, and are possible for modernization modifications after completion of the R&D program. Also, since Atlas possesses considerable excess performance capability, it appears likely that mission objectives in excess of contractual performance limitations will from time to time, be desired either because of new military target assessment, or because of new special missions which the Air Force may wish to undertake. The latter case will, in all likelihood, be accompanied by special or revised instrumentation.

In either case, (- i.e., - changes to configuration producing significant weight changes in the flight weight status, or mission objectives in excess of contractual performance limitations) a precise re-evaluation of the flight weight status will be required in order to furnish valid input to the Guidance Equations for the desired missions.

This Handbook is an interim instrument for use until it becomes an official requirement. It is also preliminary as it is under development with R&D testing, and lacks portions required for interpretation and evaluation of the effects of propellant loading variations.

PART I

INTRODUCTION
AND
GENERAL DIRECTIONS

PART I

INTRODUCTION

This is the first Handbook to be presented for use in the field. It presents the weight and balance characteristics of the XSM-65-28D Missile and is the eleventh D-R&D missile weighed.

Portions of this Handbook (Parts IV thru VI) are in development and not included in the Handbook at this time.

Part II shows the actual dry weight and balance in the condition as weighed at the factory, and the computed dry weight and balance for flight condition based on the asweighed condition. The latter is compared for reference purposes to the predicted flight dry weight and balance derived before weighing.

Part III is presented for the purpose of keeping accurate records of dry weight and balance by field personnel.

For the use of Parts II and III see the Introductions and Directions in those parts.

Extra charts are available in Part VII to be inserted in the various portions of the Handbook when and where needed.

PART II

FACTORY WEIGHING

PART II

INTRODUCTION

This portion of the Handbook presents the weight and balance characteristics of the XSM-65-28D Missile based on the shop weighing of the total missile on 13 August 1959.

The actual weight is within 19 pounds of the predicted weight. This comparison is shown in detail on page 7.

The final actual dry weight and balance for flight is entered on line 5 on page 5 and final dry weight and balance of the booster and second stage are on lines 6 and 7 respectively of the same page.

These weights can be used if no change to the missile configuration as described in this Handbook occurs at the launch site.

The weight of the missile as weighed, including items used for handling but not including airborne items which were not on during weighing is on line 1 of page 5 and this weight is carried on to Chart C, page 36 as the first entry. For use of Chart C refer to the directions on page 18.

MISSILE WEIGHING DIAGRAM (J1)

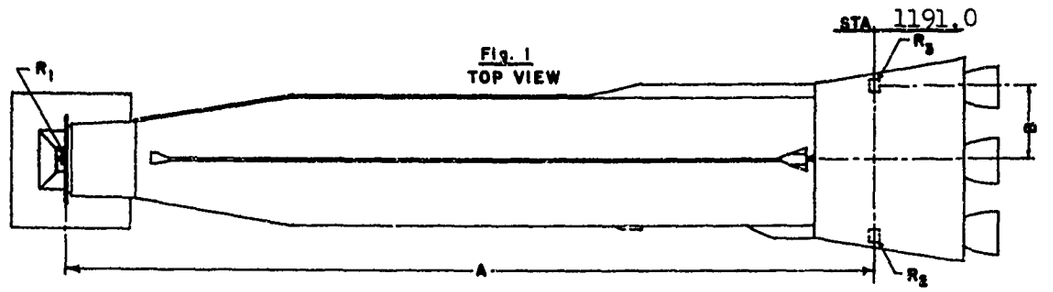


Fig. 1
TOP VIEW

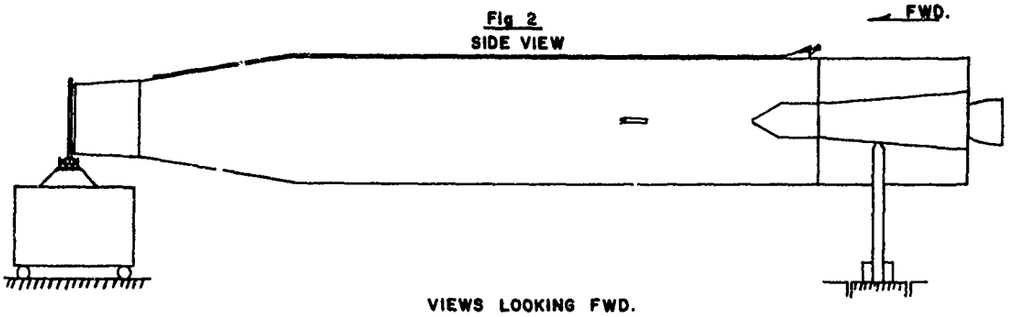


Fig 2
SIDE VIEW

VIEWS LOOKING FWD.

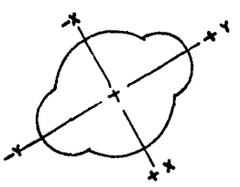


Fig. 3
45° LEFT
P_2

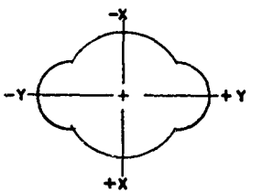


Fig. 4
0°
P_1

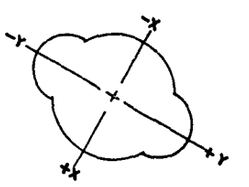


Fig. 5
45° RIGHT
P_3

A = 758.5" The distance from aft jig point (R_2 & R_3) to fwd jig point (R_1) (or distance between fore & aft reactions).

B = 68.95" The distance from reference datum to center line of reaction R_3.

SEE MISSILE WEIGHING DATA SHEET (J1)

$\bar{Z} = 1191.0 - \dfrac{R_1 \times A}{\text{Total gross wt.}}$ Used with all positions.

$P_1 = \dfrac{(R_3 - R_2) \times B}{\text{Total gross wt.}}$ Use 0° weight: (Fig. 4)

$P_2 =$ Same as P_1 Use 45° Left weights. (Fig. 3)

$P_3 =$ Same as P_1 Use 45° Right weights. (Fig. 5)

$\bar{Y} =$ Result of $P_1 + 100$

$\bar{X} = (P_2 \times 1.414) - P_1 + 100$ 45° Left (Fig. 3)

$\bar{X} = P_1 - (P_3 \times 1.414) + 100$ 45° Right (Fig. 5)

MISSILE WEIGHING DATA SHEET (J1)

DATE WEIGHED	MODEL	SERIAL NUMBER
13 August 1959	XSM-65-28D	USAF-58-2199

PLACE WEIGHED	WEIGHING PERSONNEL
Convair Plant 71	Astronautics Weights Group

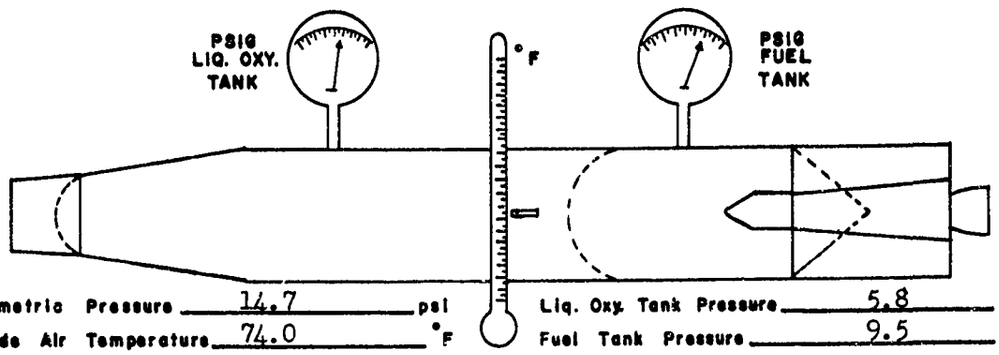
REACTION POINTS	SCALE READINGS 0°	45° L	45° R	0°	45° L	45° R	AVERAGE
FWD. POINT (R_1)	2499	2508	2571	2542	2541	2554	xxxxxxxxx
AFT. POINT LEFT (R_2)	4688	4907	4603	4653	4930	4629	xxxxxxxxx
AFT. POINT RIGHT (R_3)	5830	5583	5854	5828	5560	5832	xxxxxxxxx
TOTAL (As Weighed)	13017	12998	13028	13023	13031	13015	13018.7
* $\bar{Z}$ DIMENSION (in)	1045.4	1044.0	1041.3	1042.9	1043.1	1042.2	1043.3
* P_1 DIMENSION (in.)	6.04			6.22			
* P_2 DIMENSION (in.)		3.58			3.33		
* P_3 DIMENSION (in.)			6.62			6.37	
* $\bar{Y}$ DIMENSION (in.)	106.04			106.22			106.1
* $\bar{X}$ DIMENSION (in.)		97.62	96.68		96.92	97.21	97.1

DERIVATION OF ACTUAL DRY WEIGHT

	ITEM	WEIGHT	$\bar{Z}$	$\bar{Y}$	$\bar{X}$	WZ	WY	WX
1	MISSILE AS WEIGHED	13018.7	1043.3	106.1	97.1	13582410	1381284	1264116
2	LESS NON-FLIGHT OVERAGES	(-) 1886.1	xxxxxxxxxxxxxxxxxx			(-) 1068169	(-) 188532	(-) 189421
3	LESS GAS IN TANKS	(-) 132.6	xxxxxxxxxxxxxxxxxx			(-) 114302	(-) 13256	(-) 13256
4	PLUS SHORTAGES	(+) 3519.2	xxxxxxxxxxxxxxxxxx			(+) 2232694	(+) 378154	(+) 356708
5	TOTAL MISSILE ACTUAL WEIGHT	14519.2	1007.8	107.3	97.7	14632633	1557650	1418147
6	LESS Predicted BOOSTER ~~ACTUAL~~ WT.	(-) 5879.8	1218.5	101.4	91.0	(-) 7164536	(-) 677332	(-) 535062
7	2ND STAGE ACTUAL WEIGHT	8639.4	864.4	101.9	102.2	7468097	880318	883085

* SEE WEIGHING DIAGRAM

GAS CALCULATION DATA SHEET



Barometric Pressure 14.7 psi — Liq. Oxy. Tank Pressure 5.8 psig
Outside Air Temperature 74.0 °F — Fuel Tank Pressure 9.5 psig

Weight GN_2 in Liq. Oxy. Tank = $\frac{144(B.P. + PSIG) \times \text{Liq. Oxy. Tank Volume}}{LN_2 \text{ Gas Constant} \times (460 + \text{Ambient Temp.})}$ =

$\frac{144(\ 20.5\ ) \times 2503.2}{55.16 \times (\ 534\ )}$ = 250.86 lbs.

Weight GN_2 in Fuel Tank = $\frac{144(B.P. + PSIG) \times \text{Fuel Tank Volume}}{LN_2 \text{ Gas Constant} \times (460 + \text{Ambient Temp.})}$ =

$\frac{144(\ 24.2\ ) \times 1539.8}{55.16 \times (\ 534\ )}$ = 182.16 lbs.

Weight Diplaced Air (both tanks) = $\frac{144 \times B.P. \times \text{Total Tank Volume}}{\text{Air Constant} \times (460 + \text{Ambient Temp.})}$ =

$\frac{144(\ 14.7\ ) \times 4043.0}{53.34 \times (\ 534\ )}$ = 300.46 lbs.

GAS CENTER OF GRAVITY DETERMINATION

ITEM	WEIGHT	$\bar{Z}$	$\bar{Y}$	$\bar{X}$	WZ	WY	WX
GN_2 in Liq. Oxy. Tank	250.86	709.0	100	100	177860	25086	25086
(+) GN_2 in Fuel Tank	182.16	1063.0	100	100	193636	18216	18216
(-) Wt. Displaced Air	300.46	856.0	100	100	257194	30046	30046
Gas in Tanks-Insert on MISSILE WEIGHING RECORD - Item 3	132.56	862.3	100	100	114302	13256	13256

RECONCILIATION OF ACTUAL DRY WEIGHT

ITEM	WEIGHT	Z	Y	X
26D 2nd Stage Predicted Weight Converted to 28D	8613.4	867.9	109.9	99.2
Nose Cone	+59.2	378.0	100.0	100.0
Horizontal Adapter	-10.3	479.0	100.0	100.0
Spacer - Adapter to Nose	-9.8	453.0	100.0	100.0
Xducer Change	-.7	1219.0	70.0	108.0
Tlm. Battery Redesign	+6.6	1097.0	164.0	114.0
Predicted 28D 2nd Stage	8658.4	865.7	109.9	99.2
26D Booster Predicted Weight Converted to 28D	5880.3	1218.5	101.4	91.0
Xducer Changes	-.5	1213.0	154.0	132.0
Predicted 28D 2nd Stage	5879.8	1218.5	101.4	91.0
Total 28D Predicted	14538.2	1008.4	106.5	95.9
Total 28D Actual	14519.2	1007.8	107.3	97.7
Total Missile Variation	-19.0	-.6	+.8	+1.8

AIRBORNE SHORTAGES-SECOND STAGE

ITEM	WEIGHT	Z	Y	X
Re-entry Vehicle	2143.2	378	100	100
Horizontal Adapter	132.4	479	100	100
Spacer-Adapter to Nose	84.2	453	100	100
Fwd Bulkhead Door Boil-off Valve Instl (Est)	50.0	480	100	100
Photo-flash tunnels & Harnesses	18.0	740	163	100
Photo-flash Cartridge	8.0	740	163	100
Photo-flash Programmer	4.1	801	161	101
Main Missile Battery	42.4	1019	163	113
RSC Battery	8.0	976	163	114
Liq. Oxy. Manometer	15.3	1059	162	85
RP-1 Manometer	9.9	1055	163	89
Tlm. Battery	30.1	1097	164	114
G.E.I.P. Antenna	35.4	1099	53	147
Reto-Rockets (2)	10.3	887	163	100
Destruct Charge (1)	6.1	960	162	84
Vernier Clamshells (2)	5.8	1126	100	100
Upper Vern Fairing & Fireshield	8.1	1128	100	30
APS Fairing	20.0	1077	100	30
Lower Vern Fairing & Fireshield	9.6	1128	100	170
RP-1 Disconnect Valve	12.9	1180	68	69
ASI Single Tube System	45.0	919	178	100
Liq. Oxy. Disc. Valve	33.7	1145	145	48
Liq. Oxy. Disc. Valve Heat Shield	5.6	1139	145	48
Vern Solo	55.9	1210	129	86
Jettison Separation Xducer	.5	1132	162	112
Liq. Oxy. Tk. Press Xducers (2)	3.0	480	88	132
Total Shortage - 2nd Stage	2797.5			

AIRBORNE SHORTAGES - BOOSTER

ITEM	WEIGHT	Z	Y	X
Forward Nacelle Doors (4)	111.0	1183	100	100
Nacelles (2), Splice Plates & Mtg. Hrdw.	433.6	1245	100	100
Upper Bal. Fitting Heat Shield	1.7	1185	100	161
Lower Vern Cylinder Shield	7.8	1185	100	42
RP-1 Flex Bellows	12.4	1189	68	69
LN_2 Drain Provisions	2.3	1168	124	152
Sust. & Booster Heat Boots	102.5	1277	100	100
Liq. Oxy. F&D Valve	23.0	1218	145	48
Liq. Oxy. Disc. Bellows	23.6	1165	145	48
Bellows Heat Blanket	1.6	1165	145	48
Fwd. NAC Braces (2)	2.2	1171	100	104
Total Shortage - Booster	721.7			
Total Shortage - Missile	3519.2			

NON-AIRBORNE OVERAGES - SECOND STAGE

ITEM	WEIGHT	Z	X	Y
Nose Hato	1399.0	434	100	100
Padding Nose	2.0	470	110	120
Photo-Flash Tunnel Cover	1.6	742	163	101
Handling Adapter	182.5	468	100	98
Liq. Oxy. Press Gage & Valves	.7	774	55	140
Fuel Press Gage & Valves	2.6	1100	55	140
Vern Dessicant Covers (2)	.6	1128	100	100
Timer-Azusa	1.1	1005	162	96
Timer - Inverter	1.5	995	162	116
Timer - Gyro	1.4	960	166	105
Timer - Programmer	1.4	1100	166	105
Fuel Line Cover Plate	14.6	1175	68	69
Sust. Eng. Brace	46.0	1263	100	132
Sust. Eng. End Cover	13.9	1312	100	100
Sust. Eng. Side Covers	26.1	1265	100	100
Sust. Eng. Sil. Gel	2.2	1303	100	100
Liq. Oxy. Single Boil-off Valve & Duct	4.4	480	81	118
Timer - PU Pkg.	1.4	1019	164	86
Total Overages-Second Stage	1703.0			

NON-AIRBORNE OVERAGES - BOOSTER

ITEM	WEIGHT	Z	Y	X
Liq. Oxy. Fill & Drain Valve Cover (2)	1.0	1225	145	48
Booster Actuator Locks (4)	4.5	1226	100	90
Trailer Fittings (2)	39.0	1171	100	100
Fuel Fill & Drain Valve Cover Plate	.3	1207	64	46
Quad I Transducer Hato	2.5	1211	145	130
Booster Eng. End Covers (2)	30.6	1310	100	100
Booster Eng. Side Covers	98.2	1285	100	100
Booster Eng Silica Gel	4.4	1303	100	100
RP-1 Disc. Valve Cover	2.0	1195	68	69
Quad 3 Umbilical Brkt.	.6	1240	60	60
Total Overages - Booster	183.1			
Total Overages - Missile	1886.1			

PART III

FIELD WEIGHING

PART III

SECTION I

INTRODUCTION

PURPOSE

This Handbook of Weight and Balance Data provides the service activities with a standard system of field weight and balance control. It contains brief instructive information and is to be used as the permanent binder for the forms and charts which provide for continuous control of weight and balance of the missile. The data to be inserted on the charts and forms in this Handbook are applicable only to the individual missile, the serial number of which appears on the title page and on the various forms and charts. This Handbook is to remain with the missile until flight, then be disposed in the prescribed manner.

The charts and forms referred to herein differ in nomenclature and arrangement from those shown in previously published copies of this Handbook, since these charts are revised from time to time; however, the general principle of use will not change.

CHARTS AND FORMS

GENERAL. The standard system of field weight and balance control requires the use of several different charts and forms. They are identified as follows:

a. Record of Weight and Balance Personnel.
b. Equipment Location Zone Chart.
c. Chart A - Basic Weight Check List.
d. Missile Weighing Diagram.
e. Missile Weighing Data Sheet.
f. Gas Calculation Data Sheet.
g. Chart C - Basic Weight and Balance Record.

RESPONSIBILITY

The Missile manufacturer inserts all missile identifying data on the title page of this Handbook and on the various charts and forms. He completes all charts at the time of delivery. This record constitutes the basic weight and balance data of the missile at delivery. All subsequent changes in weight and balance are compiled by the weight and balance technician in accordance with instructions contained herein.

MISSILE WEIGHINGS

Missiles must be weighed

a. Periodically as required by pertinent directives.
b. When major modifications or repairs are made.
c. When the basic weight data contained in this Handbook are suspected to be in error.

The basic weight and cg location obtained from a weighing can only be as accurate as the scale equipment employed. Scales must be calibrated as required by existing directives.

PART III

SECTION II

DEFINITIONS

WEIGHT DEFINITIONS

BASIC WEIGHT. The "basic weight" of a missile is defined as the exact weight configuration at the time of weighing (or check-out) and is the same as the weight of the missile as weighed. This weight includes all overages, but does not include shortages or tare weight.

DRY WEIGHT. The "Dry weight" of a missile is defined as the basic weight modified by the removal of all overages and the addition of all shortages to convert the missile as weighed (or checked out) to a flight ready configuration. Dry weight equals basic weight minus overages, minus gas in tanks, plus shortages. This weight includes hydraulic fluid, but no other fluids or gases.

OVERAGE. An "overage" is any non-airborne item attached to or included within the missile at the time of weighing (or checking out) which must be removed before flight. Such items as engine protective covers, dessicant bags, dummy destruct packages, propellant tank gases are all overages.

SHORTAGE. A "shortage" is any airborne item not attached to or included within the missile at the time of weighing (or checking out) which must be added to the missile before flight. Main missile battery, nosecone, etc. are examples of shortage items.

TARE. "Tare" as used in this handbook is the weight of the weighing fixture or the weighing trailer only and is not considered an overage. The tare weight is directly subtracted from the total weight readings at the time of weighing.

BALANCE DEFINITIONS

REFERENCE DATUM. "Reference datum" is an immaginary plane outside the missile envelope from which distances are measured for balance purposes. Three reference data are used in measuring the center of gravity of missiles. The first is a vertical plane forward of the missile nose from which all fore and aft distances (Z dim.) are measured. The second is a vertical plane 100 inches to the left of missile centerline from which all lateral distances (X dim.) are measured. The third is a horizontal plane 100 inches below the missile centerline from which all vertical distances (Y dim.) are measured.

ARM. "Arm" for balance purposes is the distance in inches from one of the three reference data to the center of gravity of the item.

MOMENT. "Moment" is the weight of an item multiplied by its arm. The value of a moment is in inch pounds. Because of the large value for the total missile moment, the moments entered on Chart C are divided by 1000. Therefore, three zeros must be added to the Chart C moments when they are used.

PART III

SECTION II

DEFINITIONS (CONTINUED)

AVERAGE ARM. "Average arm" is the arm obtained by adding the weights and adding the moments of a number of items and dividing the total moment by the total weight.

BASIC MOMENT. "Basic moment" is the sum of the moments of all items making up the basic weight. When using data from an actual weighing of a missile, the basic moment is the total moment of the basic missile with respect to the reference datum.

CENTER OF GRAVITY (CG). "Center of gravity" is the point about which a missile would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the missile.

TANK GASES. Tank gas is that which is used to pressurize the tank for rigidity for handling and is included as part of the "BASIC WEIGHT" but is not part of the "DRY WEIGHT". For more detailed information see Part II, Section IV, Gas Calculation Data Sheet.

PART III

SECTION III

INSTRUCTIONS FOR USE OF THE FORM AND CHARTS

GENERAL. Correct information as to the basic weight and moment is controlled by Charts A and C after the basic weight and balance have been determined by weighing the missile. Lay out for these forms is similar to the forms used in Aircraft. Weight and Balance Handbook, AN-01-1B-40, however, use of these forms is slightly different due to the peculiar requirements of missile weight and balance. While aircraft are re-usable items, missiles are not and the repeated weighings and loading of aircraft do not apply to missiles. Therefore, accurate weight must be determined for a single mission only and the quality of this weight and balance is dependend upon proper use of Charts A and C.

RECORD OF WEIGHT AND BALANCE PERSONNEL.
Listed at the top of this form are the missile model and serial number. The form provides a continuous record of the name and grade (civilian or military) of weight and balance personnel responsible for the Handbook records, the station, the date assigned and the date relieved. All entries should be complete and legible.

PRELIMINARY WEIGHING INSTRUCTIONS. Specific weighing instructions are given at the end of Section IV. Numerous methods of weighing the missile can be used. For all weighings, assemble the necessary equipment, remove dirt, work pads, platforms, etc. from missile and see that reservoirs for hydraulic fluids are filled to normal level. Conduct an inventory of <u>all</u> equipment actually attached to or included within the missile. This shall be accomlished on the Chart A - Basic Weight Check List.

<u>NOTE</u>

The missile must be weighed in a closed hanger.

EQUIPMENT ZONE CHARTS. Equipment zone charts are provided to help locate and identify major items of missile airborne and non-airborne equipment. These items are listed with the zone reference on Chart A. The zone charts are of a general nature and will not describe each specific missile in detail.

CHART A - BASIC WEIGHT CHECK LIST. The Basic Weight Check List is a tabulation of all operating airborne equipment that is or may be installed and for which provision or fixed stowage has been made in a definite location in the missile. It also lists all non-airborne equipment that is used to maintain or handle the missile which must be removed before flight. It gives the weight and arm of the individual items for use in correcting the basic weight and moment on Chart C as changes are made in this equipment.

Inventories should be made when:

1. The missile is completed at the factory, prior to delivery.
2. The missile is received at the launch base.
3. The missile undergoes modification, major overhaul or repair.
4. Changes in equipment are made for a different type of operation or mission.
5. The missile is re-weighed.
6. Upon erection at the launch complex.
7. X-1 day from launch.
8. Putting into or breaking out of storage.

PART III

SECTION III

INSTRUCTION FOR USE OF THE FORMS AND CHARTS (CONTINUED)

9. When weight is critical for a particular mission.

The above requirements for inventories should be carried out under the following three cases. Case I - Normal operational situation with no anticipated modifications, Case II - Normal operational situation with expected site modifications, Case III - Special operational situation for missions in excess of contractual performance.
The following table clarifies:

Requirement	Case I	Case II	Case III
1	x	x	x
2			x
3		x	x
4		x	x
5		x	x
6			x
7			x
8	x	x	x
9			x

USE OF CHART A. The Basic Weight Check List is prepared by the manufacturer before delivery of the missile to the launching base. The manufacturer will write into Chart A all major items that are applicable to that missile for its original mission. Any item which is not applicable for that mission will be struct out by a continuous line through the items on Chart A. For all items that are applicable, the manufacturer will indicate when that item is airborne or non-airborne in the following manner:

Airborne equipment. Place an X in colum titled "Airborne Equipment" if the item is necessary for flight. This X must appear even though the item was not on the missile during weighing (or checking out).

Non-airborne equipment. Place a 0 in colum titled "Airbonre Equipment" if the item is necessary to handle the missile but must be removed before flight. This 0 must appear even though the item was not on the missile during weighing (or checking out).

It should be pointed out that the markings in the "Airborne Equipment" column describe the <u>desired</u> configuration of the missile for its specific <u>mission</u>, but <u>does not</u> describe the configuration at the time of weighing (or checking out). The actual configuration at the time of weighing (or checking out) is indicated under the column titled "Original Check".

The manufacturer will enter the date of weighing in the title block of the "Original Check" Column. This column <u>must</u> be used in the following manner:

1. Any <u>applicable airborne</u> item which was <u>on</u> the missile when weighed or checked out will have a line drawn through the "Shortage & Overage" columns. This indicates that the basic weight <u>includes</u> that item.
2. Any <u>applicable airborne</u> item which was <u>off</u> the missile when weighed or checked out will have a check mark in the shortage column. This indicates that the basic weight <u>does not</u> include that item.
3. Any applicable <u>non-airborne</u> item which was <u>on</u> the missile when weighed or checked out will have a check mark in the overage column.

SECTION III

INSTRUCTIONS FOR USE OF THE FORMS AND CHARTS (CONTINUED)

This will indicate that the basic weight includes that item.

4. Any applicable non-airborne item which was not on the missile when weighed or checked out will have a line drawn through the "Shortage & Overage" columns. This will indicate that the basic weight does not include that item.

NOTE

The markings in this column are directly opposite for airborne and non-airborne items. The check mark indicates that the basic weight must be corrected for these items on Chart C, Part III and on the Report of Weighing in Part II of this Handbook. A line drawn through this column indicates no correction is necessary to the basic weight.

The "original check" column, therefore represents the actual missile configuration at the time of original weighing or check-out.

"Check" columns 2 through 8 will be used by launch site personnel each time a missile weighing or check-out is required and must be accomplished for the X-1 day check. Enter the date of check-out in the blank space at head of check column as provided. Perform missile inventory. Put a check mark in the "In Missile" column for items on missile during check-out and leave blank if item is not on. After the inventory, compare with previous check-out. If no change has occured, draw a line through the "In Missile" and "See Chart C" columns. If a change has occured, put a check mark in the "See Chart C" column and make the appropriate entry in Chart C.

New entries should be written into Chart A whenever changes to the original mission or configuration occur.

Preparation of Chart A through the "Original Check" column is done by the manufacturer. The remainder of Chart C entries must be made by the launch site personnel.

CHART C - BASIC WEIGHT AND BALANCE RECORD. Chart C is a continuous history of the basic weight, moment and balance resulting from structural and equipment changes in service. At all times the last weight and moment are considered the current weight and balance of the basic missile. The basic weight as generated by Chart C entries represents the weight of the missile as described in the last Chart A check-out condition and is not the desired, or predicted final dry weight. In order to determine the final dry weight, the last basic weight from Chart C must have all flight items still missing added to it and all non-flight items subtracted from it. In theory, the X-1 day check should produce a basic weight equal to the predicted final dry weight. This weight should agree with the dry weight obtained in Part II of this Handbook if no missile configuration changes occur. It should agree when any modifications after delivery are applied to the dry weight in Part II.

PART III

SECTION III

INSTRUCTIONS FOR USE OF THE FORMS AND CHARTS (CONTINUED)

USE OF CHART C. Each time an inventory is made, Chart C should be brought up to date. The manufacturer will make the first basic weight entry in Chart C and this weight is the same as the missile as weighed. This basic weight includes all non-flight overages on the missile, all gases in propellant tanks, but does not include flight items that were short during weighing. Part II of this Handbook converts the basic weight into a predicted dry weight by making corrections for the overages and shortages. Chart C accomplishes the same thing at the launch site as these changes occur.

After completion of any Chart A check-out, enter all indicated Chart C entries from Chart A onto Chart C as follows:

1. Enter the date the check-out was made in the left column of Chart C.
2. Indicate by a check mark, in the second or third column, whether an item is being added to or removed from the missile.
3. Write out a complete description of the item in the fourth column.
4. In the weight change columns enter the weight to the nearest tenth, the three arms to the nearest tenth and the moments divided by 1000.
5. Indicate items added or removed by plus or minus signs before the weights and moments.
6. When all applicable entries for the particular check-out are made, retotal Chart C and enter the new basic weight below the previous one in the small block at the bottom of Chart C.
7. The dates entered on Chart C must be the same as the dates of the check-outs on Chart A.
8. The X-1 day check-out should remove any remaining non-flight items and install all remaining flight items, yielding either the original predicted dry weight from Part II of this Handbook or that predicted weight plus modification that have occured since the original weighing.

NOTE

All basic weights in the Handbook include the gases in the propellant tanks. When a predicted dry weight is desired, the gas present at the time of the last weighing and calculated on the form provided in the Handbook should be deleted from the Basic Weight. Tank gases must be recalculated as a part of each successive weighing procedure. Atmospheric and internal tank gas condition must be known in order to perform each gas calculation. These gases must be deleted on Chart C after the X-1 day check-out or whenever predicted performance weights are to be generated. Flight weight gases are included with residuals in Part V, Chart F, Line 2.

EXAMPLE IN THE USE OF CHART A

CHART A — BASIC WEIGHT CHECK LIST

PAGE OF PAGES | MISSILE MODEL XSM-650 | SERIAL NUMBER XXD

ORIGINAL CHECK 2 AUG 1961 | RECORD OF CHECKING (Enter date) 16 Aug 1961

ZONE AND ITEM NUMBER	ITEMS AND LOCATION (Grouped by Zone)	WEIGHT	ARMS $\bar{Z}$	ARMS $\bar{Y}$	ARMS $\bar{X}$	AIRBORNE EQUIPMENT	CHECK — SHORTAGES — OVERAGES	2 IN MISSILE	2 SEE CHART C	3 IN MISSILE	3 SEE CHART C	4 IN MISSILE	4 SEE CHART C	5 IN MISSILE	5 SEE CHART C	6 IN MISSILE	6 SEE CHART C	7 IN MISSILE	7 SEE CHART C	8 IN MISSILE	8 SEE CHART C
A-1	LOW DRAG PAIRING																				
A-2	NOSE — MK 8 — MOD VI	55000	400	100	100	X	✓														
A-3	NOSE HATO	1500.0	400	100	100	0		✓													
A-4	ADAPTER — VERTICAL																				
	ADAPTER — HORIZONTAL	2046	475	100	100	X	✓	✓	✓												
	~~SPACER — ADAPTER TO NOSE~~	~~393~~	~~455~~	~~100~~	~~100~~																
	HANDLING ADAPTER	2000	490	100	100	0		✓	✓												
C-7	BOOSTER ENG SIDE COVERS	982	1285	100	100	0		✓	✓												
A-5	POD TO NOSE WIREWAY																				
	WIREWAY COVERS	117	626	162	100	X															

EXAMPLE

1. Factory Weighing.
2. Launch Site Weighing.
3. Was originally not applicable for this mission. - condition unchanged

(X) indicates item is necessary for flight. (✓) in shortage Col. indicates shortage of item at factory weighing (or checking out). Line drawn through Col. 2 check columns indicates condition unchanged at launch site weighing (or checking out).

4. (0) indicates item necessary to handle missile. (✓) in overage Col. indicates presence of item at factory weighing (or checking out). Line drawn through Col. 2 check Columns indicated condition unchanged at launch site weighing (or checking out).
5. Was originally not applicable for this mission. - condition unchanged

(X) indicates item is necessary for flight. (✓) in shortage Col. indicates shortage of item at factory weighing (or checking out). (✓) in the "In Missile" Col. indicates presence of item at launch site weighing (or checking out). (✓) in "See Chart C" Col. indicates item is to be added on Chart "C".

6. (0) indicates item necessary to handle missile. (✓) in overage Col. indicates presence of item at factory weighing (or checking out). Blank "In Missile" Col. indicates absence of item at launch site weighing (or checking out). (✓) in the "See Chart C" Col. indicates it is to be subtracted on "Chart C".
7. (X) indicates item necessary for flight. Line drawn through "Shortage and Overage" Col. indicates presence of item at time of factory weighing (or checking out). Line drawn through Col. 2 check columns indicates condition unchanged at launch site weighing (or checking out).
8. (0) indicates item necessary to handle missile. Line drawn through "Shortage and Overage" Col. indicates absence of item at time of factory weighing (or checking out) (✓) in the "In Missile " Col. indicates presence of item at launch site weighing (or checking out). (✓) in the "See Chart C" Col. indicates item is to be added on "Chart C".
9. (X) indicates item necessary for flight. Line drawn through "Shortage and Overage" Col. indicates presence of item at time of factory weighing (or checking out). Line drawn through Col. 2 check columns indicates condition unchanged at launch site weighing (or checking out).
10. Was originally not applicable for this mission. - condition unchanged

EXAMPLE IN THE USE OF CHART C

CHART C — BASIC WEIGHT AND BALANCE RECORD
(CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT AFFECTING WEIGHT AND BALANCE)

MISSILE MODEL: XSM-65D | SERIAL NUMBER: XX D | PAGE NUMBER:

DATE	ITEM NO IN	ITEM NO OUT	DESCRIPTION OF ARTICLE OR MODIFICATION	(+) AND (-) WEIGHT CHANGE: WEIGHT	I ARM	I MOMENT /1000	V ARM	V MOMENT /1000	X ARM	X MOMENT /1000
8/2/61			TOTAL MISSILE AS WEIGHED (BASIC WEIGHT)	165000	1050.	17505	1061	1751	961	1586
9/16/61	✓		Adapter - Horizontal	+246.6	475	+97	100	+20	100	+20
9/16/61		✓	Handling Adapter	-200.0	490	-98	100	-20	100	-20
9/16/61	✓		Booster Eng. Side Covers	+98.2	1285	+126	100	+10	100	+10

EXAMPLE

RUNNING TOTAL BASIC MISSILE DRY

8/2/61			TOTAL MISSILE AS WEIGHED (BASIC WEIGHT)	165000	1050	17505	1061	1751	961	1586
9/16/61			Revised Missile Basic Weight	165246.6	1041.9	172130	1061	1761	961	1586

(1) Missile as weighed at the factory. (Basic Weight)

(2) Items that were indicated on "Chart A" by a (✓) in "See Chart C" Column. Note that the dates are same as shown on "Chart A" at the head of the Check Columns and that a (✓) in the IN Col. represents addition (+) and a (✓) in the OUT Col. represents subtraction (-).

(3) Missile as weighed at factory. (Basic Weight).

(4) Missile new basic weight after additions and subtractions were made to the factory basic weight.

PART III

SECTION IV

INSTRUCTIONS FOR ADDITIONAL DATA FORMS FOR WEIGHING

GAS CALCULATION DATE SHEET. Each time a missile is weighed, a calculation of the amount of gas in the propellant tanks must be made. This gas is used to pressurize the tanks for handling, but is not a part of the launch dry weight. Gas weight is part of the basic weight since it is always present during weighings (except if weighed under stretch in the trailer). Gas weight must be subtracted from the basic weight when preparing the final launch dry weight.

To calculate the amount of gas for a weighing, enter the following items on the Gas Calculation Data Sheet:

1. Barometric pressure in pounds per square inch (or the nominal value of 14.7 psi if the pressure is not obtainable).
2. Liquid oxygen tank pressure in pounds per square inch gage.
3. Fuel tank pressure in pounds per square inch gage.
4. Outside air temperature around the tank in degrees F.

Enter these values as indicated on the data sheet and determine the weight of gas in each tank.

Since only the weight of gas in excess of the weight of normal atmospheric air is actually sensed as gas weight (boyancy effect), subtract the weight of displaced air from the total gas weight to obtain the effective weight of gas. Enter this effective value and C G on line 3 of this Missile Weighing Data Sheet.

MISSILE WEIGHING DATA SHEET. For launch site weighing purposes, the preferred method is by trailer weighing. The C G from the factory weighing is modified and used with the actual weight as derived in the trailer weighing.

NOTE

Missile-trailer weighing and trailer weighing must be done within one day of each other AND the same weighing kit must be used.

The trailer can be weighed just prior to installing the missile and just after to eventually determine the missile weight. Another method is to weigh the missile and trailer just prior to missile erection and then weigh the trailer as soon as it is removed from the erector.

WARNING

Trailer and missile weighings must be done in a closed area since the weighing method is unstable due to wind gusts in outside areas.

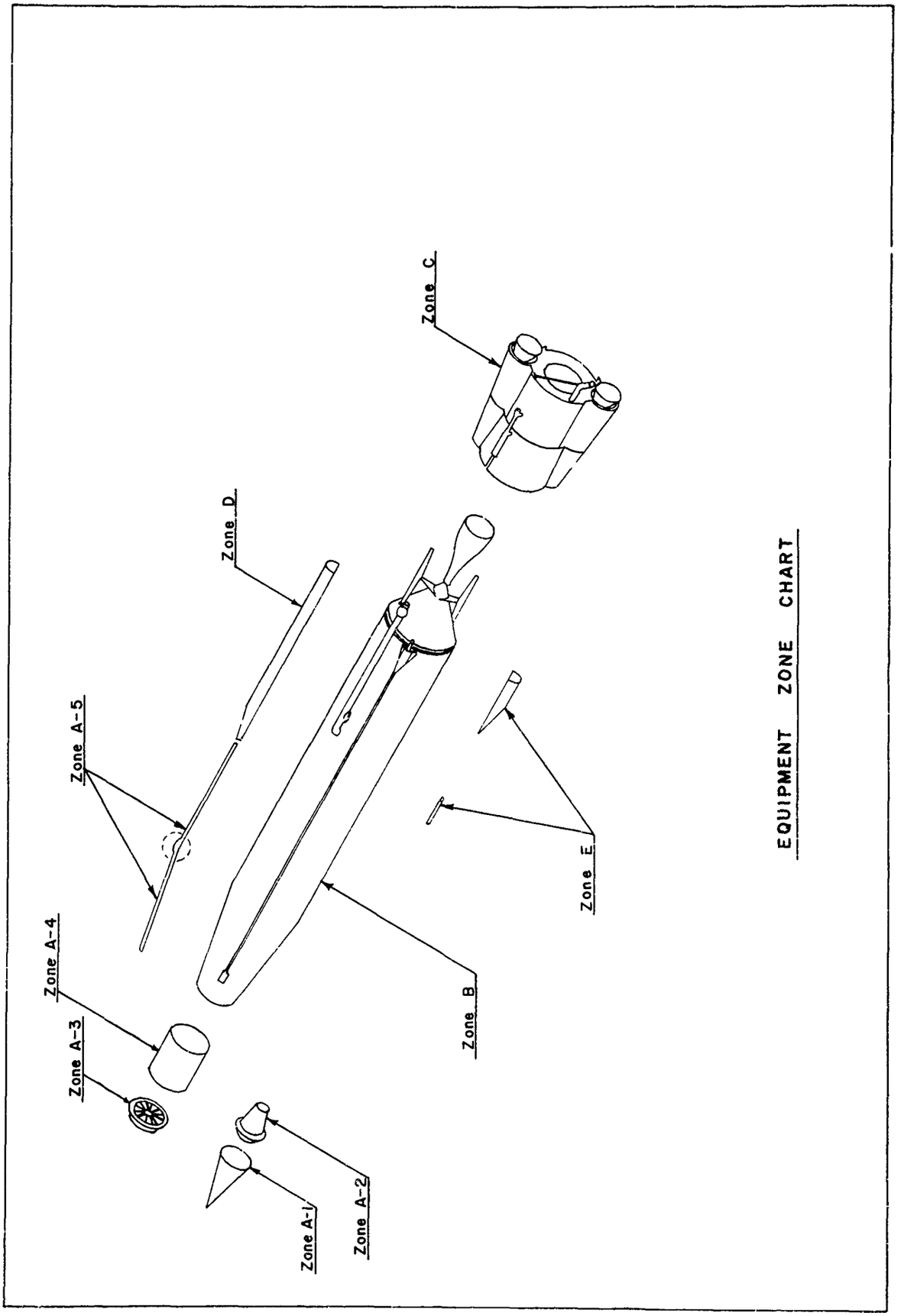
LAUNCH SITE MISSILE WEIGHING. Use either Missile Weighing Data Sheet (T3) for a three point weighing or Missile Weighing Data Sheet (T4) for a four point weighing. Trailer configuration must be the same for each weighing.

PART III

SECTION IV

INSTRUCTIONS FOR ADDITIONAL DATA FORMS FOR WEIGHING (CONTINUED)

1. Load trailer and missile on cells to a visual level condition with the trailer tires just clear of ground.
2. Read three (of four) load cells and enter in column 1 of "Scale Readings".
3. Re-read and enter in column 2.
4. Re-read and enter in column 3.
5. Unload and zero out the cells.
6. Repeat steps 1 thru 4 and enter in columns 4 thru 6.
7. Unload.
8. Repeat steps 1 thru 7 to weigh the trailer alone.
9. Enter readings in columns 1 thru 6 of "Scale Readings-Trailer".
10. Average the readings for each reaction point and the totals and enter under the "Average" column on lines 8 and 9 respectively for the missile and trailer weighing and the trailer weighing.
11. Subtract average total line 9 from average total line 8. This is the basic weight of the missile as weighed.
12. Enter this value on line 1 of "Derivation of Actual Dry Weight".
13. Correct Chart C to reflect the configuration of this weighing and the Chart A check-out. Determine the Z, Y and X arms for the new basic weight from Chart C and enter these on line 1 next to the actual weight as weighed (basic weight).
14. By reference to Chart A, summarize the weight and moments of all non-flight items still on the missile at the time of weighing and enter on line 2 of "Derivation of Actual Weight".
15. Summarize the weight and moments of all flight items not on the missile during weighing and enter on line 4 of "Derivation of Actual Weight".
16. Calculate the weight and moments for the propellant tank gases and enter on line 3 of "Derivation of Actual Dry Weight".
17. Subtract lines 2 and 3 from line 1 and add line 4 to linel. This is the new weight and balance for the total dry launch weight.
18. If no additions or deletions were made to Chart A since the factory weighing, enter the Booster Actual Weight and moments from line 6 of the "Missile Weighing Data Sheet" from Part II of this Handbook onto line 6 of "Derivation of Actual Dry Weight" of the current data sheet.
19. If additions or deletions were made to Chart A, select only those that are <u>Booster flight items.</u> Summarize these weights and moments and correct the factory Booster actual weight by these amounts. Enter this new Booster weight and balance on line 6 of the current data sheet.
20. Subtract line 6 from line 5 and enter on line 7. This is the new Sustainer actual dry launch weight.



EQUIPMENT ZONE CHART

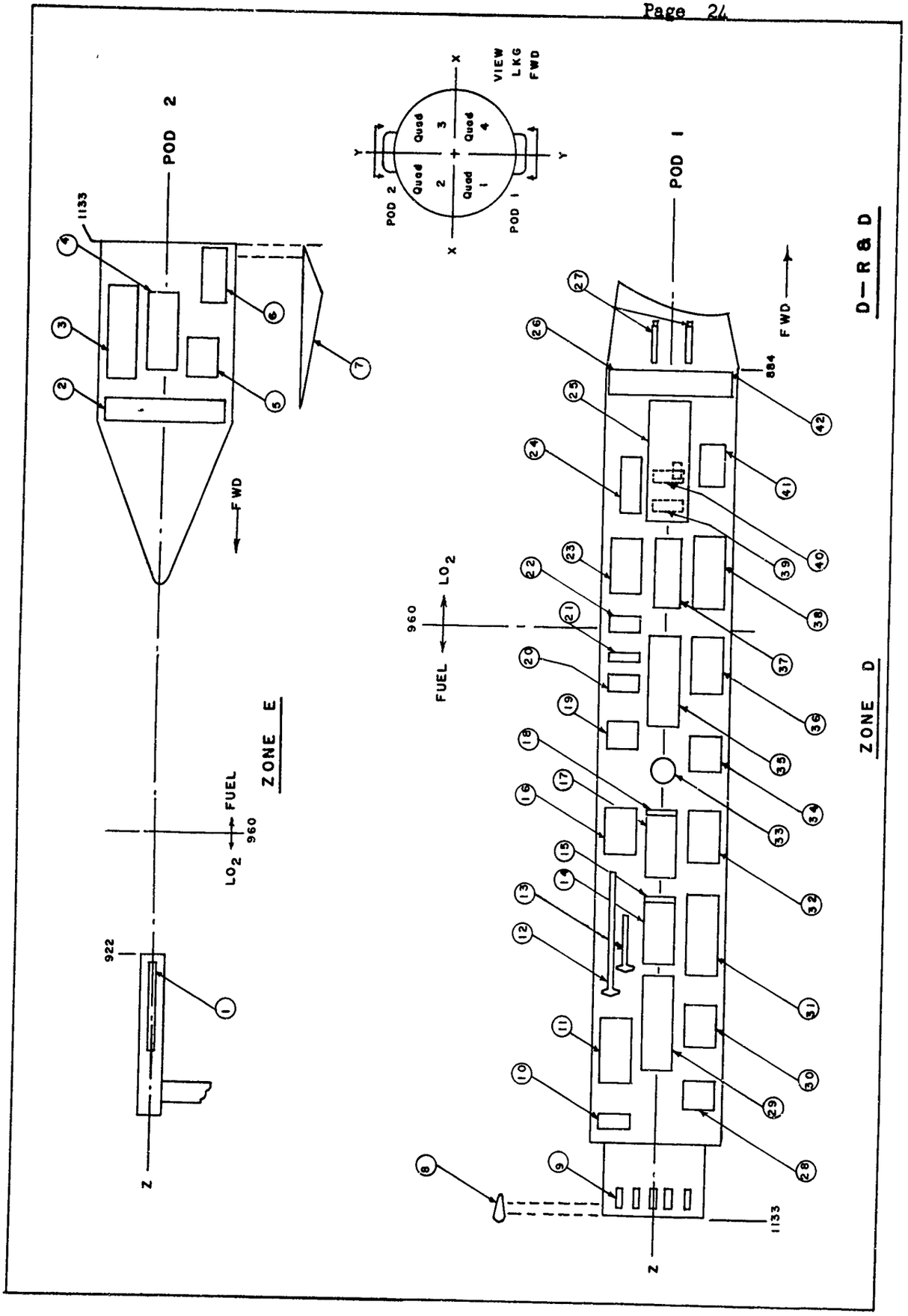

POD 2
POD 1
VIEW LKG FWD
Quad 1
Quad 2
Quad 3
Quad 4
FWD
ZONE E
ZONE D
D-R&D
FUEL
LO2
960
922
884
1133
Z

CHART A — BASIC WEIGHT CHECK LIST

PAGE 1 OF 7 PAGES | MISSILE MODEL: XSM-65D-28 | SERIAL NUMBER: USAF 58-2199

ZONE AND ITEM NUMBER	ITEMS AND LOCATION (Grouped by Zone)	WEIGHT	ARMS Z	ARMS Ȳ	ARMS X̄	AIRBORNE EQUIPMENT	RECORD OF CHECKING (Enter date): 13 August '59 — CHECK: – Shortage	CHECK: – Overage	CHECK: 2 IN MISSILE / SEE CHART C	CHECK: 3 IN MISSILE / SEE CHART C	CHECK: 4 IN MISSILE / SEE CHART C	CHECK: 5 IN MISSILE / SEE CHART C	CHECK: 6 IN MISSILE / SEE CHART C	CHECK: 7 IN MISSILE / SEE CHART C	CHECK: 8 IN MISSILE / SEE CHART C
A-1	~~LOW DRAG FAIRING~~														
A-2	~~NOSE — MK2 MOD 2A~~	~~3770.0~~	~~434~~	~~100~~	~~100~~										
	~~NOSE — MK2 MOD 1E8~~	~~3316.0~~	~~430~~	~~100~~	~~100~~										
	NOSE — MK3	2143.2	378	100	100	X	✓								
	~~NOSE — RVX2~~	~~2500.0~~	~~361~~	~~100~~	~~100~~										
A-3	NOSE HATO	1399.0	434	100	100	O		✓							
A-4	~~ADAPTER — VERTICAL~~	~~204.4~~	~~468~~	~~100~~	~~98~~										
	ADAPTER — HORIZONTAL	132.4	479	100	100	X	✓								
	SPACER ADAPTER TO NOSE	84.2	453	100	100	X	✓								

CHART A — BASIC WEIGHT CHECK LIST

PAGE 2 OF 7 PAGES | MISSILE MODEL XSM-65D-28 | SERIAL NUMBER USAF 58-2199

ZONE AND ITEM NUMBER	ITEMS AND LOCATION (Grouped by Zone)	WEIGHT	ARMS Z	ARMS Y	ARMS X	AIRBORNE EQUIPMENT	RECORD OF CHECKING (Enter date) 13 August '59 — CHECK — Shortage	Overage	2 IN MISSILE	2 SEE CHART C	3 IN MISSILE	3 SEE CHART C	4 IN MISSILE	4 SEE CHART C	5 IN MISSILE	5 SEE CHART C	6 IN MISSILE	6 SEE CHART C	7 IN MISSILE	7 SEE CHART C	8 IN MISSILE	8 SEE CHART C
A-5	POD TO NOSE WIREWAY:																					
	WIREWAY COVERS	15.5	626	162	100	X	—	—														
	PHOTO-FLASH PROGRAMMER	4.1	801	161	101	X	✓															
	PHOTO-FLASH EQUIP INSTL.	23.2	742	163	101	X	✓															
	P.F. REPLACEMENT FAIRING	1.6	742	163	101	O		✓														
	SOLAR CELL XDUCERS	.5	838	161	101	X	—	—														
B-1	LIQ. OXY. BOIL-OFF VALVE INSTL.	50.0	480	81	100	X	✓															
B-2	APS FAIRING	20.0	1077	100	30	X	✓															
B-3	UPPER VERNIER FAIRING	8.1	1128	100	30	X	✓															
~~B-3~~	~~UPPER VERNIER FAIRING~~	~~10.9~~	~~1122~~	~~100~~	~~30~~																	
B-4	LOWER VERNIER FAIRING	10.9	1122	100	170	X	✓															
B-5	UPPER VERNIER ENGINE	78.5	1127	100	27	X	—	—														
B-6	LOWER VERNIER ENGINE	78.5	1127	100	173	X	—	—														
B-7	SUSTAINER ENGINE BRACE	46.0	1263	100	132	O		✓														

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CHART A — BASIC WEIGHT CHECK LIST

PAGE 3 OF 7 PAGES | MISSILE MODEL XSM-65D-28 | SERIAL NUMBER USAF 58-2199

ZONE AND ITEM NUMBER	ITEMS AND LOCATION (Grouped by Zone)	WEIGHT	ARMS $\bar{Z}$	ARMS $\bar{Y}$	ARMS $\bar{X}$	AIRBORNE EQUIPMENT	RECORD OF CHECKING (Enter date) 13 August '59 — CHECK - Shortage	CHECK - Overage
B-8	SUSTAINER ENG. END COVERS	13.9	1312	100	100	0		✓
B-9	SUSTAINER ENG. SIDE COVERS	33.7	1265	100	100	0		✓
B-10	SUSTAINER ENG. SILICA GEL	2.3	1303	100	110	0		✓
C-1	FWD. NACELLE DOORS	111.0	1183	100	100	X	✓	
C-2	AFT. NACELLES	433.6	1245	100	100	X	✓	
C-3	BOOSTER & SUSTAINER HEAT BOOTS	102.5	1277	100	100	X	✓	
C-4	UPPER CYLINDER HEAT SHIELD	7.3	1184	100	40	X	—	
C-5	LOWER CYLINDER HEAT SHIELD	7.3	1184	100	160	X	✓	
C-6	BOOSTER END COVERS	30.6	1310	100	100	0		✓
C-7	BOOSTER ACTUATOR LOCKS	4.5	1226	100	100	0		✓
C-8	BOOSTER ENG. SILICA GEL	4.4	1303	100	100	0		✓
C-9	RP-1 FILL & DRAIN VALVE	18.1	1216	62	48	X	—	

CHECK 2 3 4 5 6 7 8 — IN MISSILE / SEE CHART C

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CHART A — BASIC WEIGHT CHECK LIST

PAGE 4 OF 7 PAGES | MISSILE MODEL XSM-65D-28 | SERIAL NUMBER USAF 58-2199

ZONE AND ITEM NUMBER	ITEMS AND LOCATION (Grouped by Zone)	WEIGHT	ARMS $\bar{Z}$	ARMS $\bar{Y}$	ARMS $\bar{X}$	AIRBORNE EQUIPMENT	RECORD OF CHECKING (Enter date): 13 August '59 — CHECK — Shortage / Overage
C-10	RP-1 FILL & DRAIN VALVE COVER	2.0	1223	61	42	0	
C-11	LIQ. OXY. FILL & DRAIN VALVE	23.0	1218	145	48	X	✓
C-12	LIQ. OXY. FILL & DRAIN VALVE COVER	2.0	1225	145	48	0	
C-13	TRAILER FITTINGS	39.0	1171	100	100	0	✓
C-14	BOOSTER ENG. SIDE COVERS	98.2	1285	100	100	0	✓
D-8	AZUSA BOOM ANTENNA	4.6	1135	151	41	X	✓
D-9	UMBIL. DUST PLUGS	10.5	1128	163	100	0	
D-10	GAGE & SUPT. BRACKET	2.8	1105	161	86	X	
D-11	AZUSA TRANSPONDER	44.0	1084	164	86	X	
D-12	LIQ. OXY. MANOMETER	15.3	1059	162	85	X	✓
D-13	RP-1 MANOMETER	9.9	1055	163	89	X	✓
D-14	RSC SET	48.3	1045	166	100	X	

CHECK columns: – (Shortage / Overage), 2, 3, 4, 5, 6, 7, 8 — each: IN MISSILE / SEE CHART C

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CHART A — BASIC WEIGHT CHECK LIST

PAGE 5 OF 7 PAGES | MISSILE MODEL XSM-65D-28 | SERIAL NUMBER USAF 58-2199

ZONE AND ITEM NUMBER	ITEMS AND LOCATION (Grouped by Zone)	WEIGHT	ARMS $\bar{Z}$	ARMS $\bar{Y}$	ARMS $\bar{X}$	AIRBORNE EQUIPMENT	RECORD OF CHECKING (Enter date) 13 August '59 — CHECK 1 Shortage	1 Overage	2 IN MISSILE	2 SEE CHART C	3 IN MISSILE	3 SEE CHART C	4 IN MISSILE	4 SEE CHART C	5 IN MISSILE	5 SEE CHART C	6 IN MISSILE	6 SEE CHART C	7 IN MISSILE	7 SEE CHART C	8 IN MISSILE	8 SEE CHART C
D-15	~~RSC BATTERY~~	~~3.7~~	~~1035~~	~~166~~	~~100~~																	
D-16	P/U CANNISTER	45.2	1019	164	86	X																
D-17	RSC SET	48.3	1016	166	100	X																
D-18	~~RSC BATTERY~~	~~3.7~~	~~1007~~	~~168~~	~~100~~																	
D-19	VIBRATRON TRANSDUCER	3.0	992	163	87	X																
D-20	RSC RING COUPLER	1.2	981	160	87	X																
D-21	RSC ARMING SWITCH	1.3	970	161	84	X																
D-22	DESTRUCTOR	5.7	960	162	84	X	✓															
D-23	ACOUSTICA CANNISTER	15.9	943	164	86	X																
D-24	RATE BEACON MOD III	35.0	920	166	87	X																
D-25	FLUSH MOUNTED ANTENNA	12.3	914	171	100	X																
D-26	RSC & TLM. ANTENNA	17.0	892	168	100	X																
D-27	RETRO - ROCKETS	103	877	163	100	X	✓															
D-28	TLM. BATTERY	301	1097	164	114	X	✓															
D-29	AUTO-PILOT PROGRAMMER	93.0	1074	166	100	X																
D-30	TLM. ACCESS PACKAGE	21.3	1077	167	114	X																
D-31	TLM. SET	84.8	1045	164	114	X																

CHART A — BASIC WEIGHT CHECK LIST

PAGE 6 OF 7 PAGES | MISSILE MODEL: XSM-65D-28 | SERIAL NUMBER: USAF 58-2199

ZONE AND ITEM NUMBER	ITEMS AND LOCATION (Grouped by Zone)	WEIGHT	ARMS $\bar{Z}$	ARMS $\bar{Y}$	ARMS $\bar{X}$	AIRBORNE EQUIPMENT	RECORD OF CHECKING (Enter date): 13 August '59 — CHECK — Shortage	CHECK — Overage
D-32	MAIN MISSILE BATTERY	42.4	1019	163	113	X		✓
D-32	~~MAIN MISSILE BATTERY~~	~~44.2~~	1019	163	113			
D-33	NAA RELAY BOX & MTS.	10.3	996	162	100	X		
D-34	POWER CHANGEOVER SWITCH	7.2	990	162	114	X		
D-35	AUTO-PILOT GYRO	88.2	975	166	100	X		
D-36	RSC BATTERY	8.0	976	163	114	X		✓
D-37	DECODER COMMAND MOD III	47.8	944	166	100	X		
D-38	INVERTER	66.4	949	164	114	X		
D-39	TRANSDUCER INSTAL.	1.8	927	162	100	X		
D-40	DIFF. PRESS. INSTAL.	2.9	916	163	100	X		
D-41	PULSE BEACON MOD III	33.0	912	165	114	X		

CHECK: 1 IN MISSILE / SEE CHART C; 2 IN MISSILE / SEE CHART C; 3 IN MISSILE / SEE CHART C; 4 IN MISSILE / SEE CHART C; 5 IN MISSILE / SEE CHART C; 6 IN MISSILE / SEE CHART C; 7 IN MISSILE / SEE CHART C; 8 IN MISSILE / SEE CHART C

RCP

CHART A — BASIC WEIGHT CHECK LIST

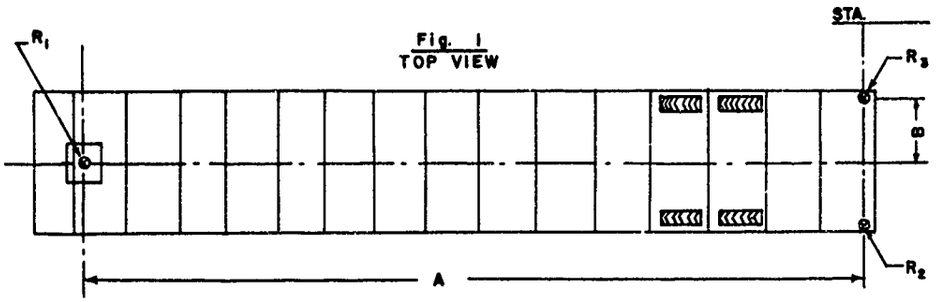
PAGE 7 OF 7 PAGES | MISSILE MODEL XSM-65D-28 | SERIAL NUMBER USAF 58-2199

ZONE AND ITEM NUMBER	ITEMS AND LOCATION (Grouped by Zone)	WEIGHT	ARMS			AIRBORNE EQUIPMENT	RECORD OF CHECKING (Enter date) 13 August '59 — CHECK — Shortage / Overage
			$\bar{Z}$	$\bar{Y}$	$\bar{X}$		1 2 3 4 5 6 7 8
E-1	GUIDANCE ANTENNA	3.5	907	37	100	X	
E-2	RSC & TLM. ANTENNA	17.0	1019	32	100	X	
E-3	GE IP RATE BEACON MOD II	78.5	1105	37	86	X	
E-4	GE IP PULSE BEACON MOD II	62.0	1105	36	100	X	
E-5	GE IP CODER MOD II	28.2	1098	37	114	X	
E-6	~~AZUSA DR ANTENNA~~	~~2.3~~	~~1123~~	~~36~~	~~118~~		
E-7	GE IP DR ANTENNA	35.3	1099	53	147	X	

Each CHECK column: IN MISSILE / SEE CHART C

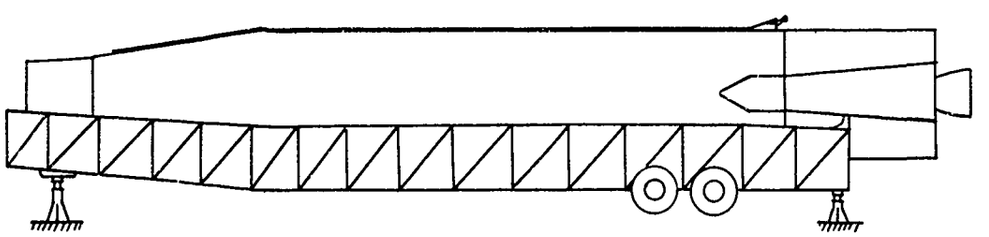
MISSILE WEIGHING DIAGRAM (T3)

Fig. 1
TOP VIEW



FWD.

Fig. 2
SIDE VIEW



A = _____ The distance between fore & aft reactions.

B = _____ The distance from reference datum to center line of reaction R_3

SEE MISSILE WEIGHING DATA SHEET (T3)

$$\overline{Z} = \text{STA.} \_\_\_\_\_ - \frac{\text{Missile } R_1 \times A}{\text{Total Missile WT.}}$$

$$\overline{Y} = \frac{\text{Missile } (R_3 - R_2) \times B}{\text{Total Missile WT.}} + 100$$

NOTE:
C.G. DETERMINATION FOR REFERENCE ONLY. C.G. IS NOT ORDINARILY DETERMINED FROM TRAILER WEIGHINGS.

MISSILE WEIGHING DATA SHEET (T3)

DATE WEIGHED	MODEL	SERIAL NUMBER
PLACE WEIGHED	WEIGHING PERSONNEL	

SCALE READINGS — MISSILE & TRAILER

	REACTION POINTS		1ST	2ND	3RD		4TH	5TH	6TH	AVERAGE
	FWD. POINT (R_1)	LOAD				UNLOAD — LOAD				
	AFT. POINT (R_2) LEFT									
	AFT. POINT (R_3) RIGHT									
8	TOTAL (AS WEIGHED)									

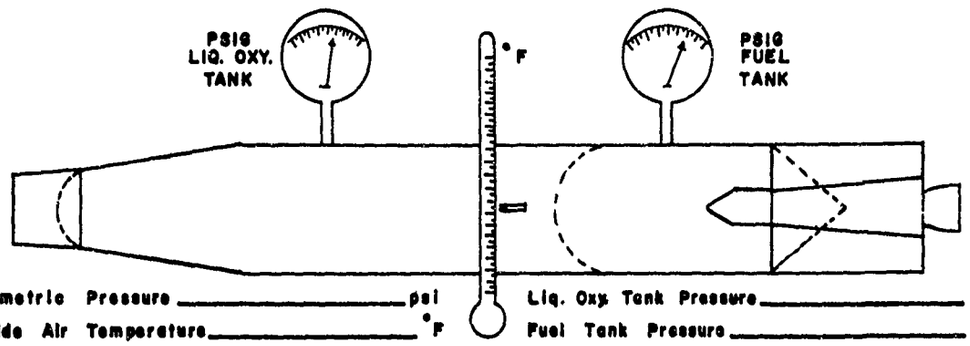
SCALE READINGS — TRAILER

	REACTION POINTS		1ST	2ND	3RD		4TH	5TH	6TH	AVERAGE
	FWD. POINT (R_1)	LOAD				UNLOAD — LOAD				
	AFT. POINT (R_2) LEFT									
	AFT. POINT (R_3) RIGHT									
9	TOTAL (AS WEIGHED)									

DERIVATION OF ACTUAL DRY WEIGHT

	ITEM	WEIGHT	$\bar{Z}$	$\bar{Y}$	$\bar{X}$	WZ	WY	WX
1	MISSILE AS WEIGHED							
2	LESS NON-FLIGHT OVERAGES	(-)				(-)	(-)	(-)
3	LESS GAS IN TANKS	(-)				(-)	(-)	(-)
4	PLUS SHORTAGES	(+)				(+)	(+)	(+)
5	TOTAL MISSILE ACTUAL WEIGHT							
6	LESS BOOSTER ACTUAL WT.	(-)				(-)	(-)	(-)
7	2ND STAGE ACTUAL WEIGHT							

GAS CALCULATION DATA SHEET



Barometric Pressure _____ psi
Outside Air Temperature _____ °F

Liq. Oxy. Tank Pressure _____ psig
Fuel Tank Pressure _____ psig

Weight GN_2 in Liq. Oxy. Tank = $\frac{144(B.P. + PSIG) \times \text{Liq. Oxy. Tank Volume}}{LN_2 \text{ Gas Constant} \times (460 + \text{Ambient Temp.})}$ =

$\frac{144(\quad) \times 2503.2}{55.16 \times (\quad)}$ = _____ lbs.

Weight GN_2 in Fuel Tank = $\frac{144(B.P. + PSIG) \times \text{Fuel Tank Volume}}{LN_2 \text{ Gas Constant} \times (460 + \text{Ambient Temp.})}$ =

$\frac{144(\quad) \times 1539.8}{55.16 \times (\quad)}$ = _____ lbs.

Weight Displaced Air (both tanks) = $\frac{144 \times B.P. \times \text{Total Tank Volume}}{\text{Air Constant} \times (460 + \text{Ambient Temp.})}$ =

$\frac{144(\quad) \times 4043.0}{53.34 \times (\quad)}$ = _____ lbs.

GAS CENTER OF GRAVITY DETERMINATION

ITEM	WEIGHT	$\bar{Z}$	$\bar{Y}$	$\bar{X}$	WZ	WY	WX
GN_2 in Liq. Oxy. Tank		709.0	100	100			
(+) GN_2 in Fuel Tank		1063.0	100	100			
(−) Wt. Displaced Air		856.0	100	100			
Gas in Tanks-Insert on MISSILE WEIGHING RECORD—Item 3							

MISSILE WEIGHT MONITOR LOG

MISSILE _____

COMPLEX _____

PAGE _____

NOTE: KEEP PAGES IN SEQUENCE.

DRAWING NO.	ADD SUB.	ITEM DESCRIPTION	STATION	QUAD.	WEIGHT		INSPECTION STAMP & DATE	REMARKS

CHART C — BASIC WEIGHT AND BALANCE RECORD

(CONTINUOUS HISTORY OF CHANGES IN STRUCTURE OR EQUIPMENT AFFECTING WEIGHT AND BALANCE)

PAGE NUMBER

MISSILE MODEL XSM-65D-28 SERIAL NUMBER USAF 58-2199

DATE	ITEM NO IN	ITEM NO OUT	DESCRIPTION OF ARTICLE OR MODIFICATION	(+) AND (−) WEIGHT CHANGE WEIGHT	Z ARM	Z MOMENT M	Y ARM	Y MOMENT M	X ARM	X MOMENT M
8-13-59			Total Missile Dry Weight as Weighed	13018.7	1043	135824	106.1	1381.3	97.1	1264.1
			Delivered to Convair Operations, AMR							
			Begin Chart C Entries							
				RUNNING TOTAL BASIC MISSILE DRY						
				13018.7	1043	135824	106.1	1381.3	97.1	1264.1
8-13-59			Total Missile Dry Basic Weight							